IEEE Canada

KITCHENER-WATERLOO SECTION

January 2004

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Upcoming Events

Check http://ece.uwaterloo.ca/~ieee_kw/presentations.html for updated information.

CCECE 2004 - Technology Driving Innovation.

Tony Kormos
The next Canadian Conference of Electrical and Computer Engineering will be held in Niagara Falls in May 2004. This conference, organized by local IEEE sections, provides a forum for Canada's best emerging Engineering talent and industrial leaders to present, participate, sponsor and network between partners in Canada's high technology frontier. For more information, see: http://www.ieee.ca/ccece04

CCECE 2004 – Student Member Funding

As student participation in the conference is both critical to its success and a unique development opportunity for students as future engineers, the IEEE Kitchener-Waterloo Section offers to it's Student Members (in good standing) a subsidy of up to $100 per student to attend CCECE 2004. Effectively, this reduces the IEEE Student Member conference registration fee by 50%.

This subsidy is available on a first-come-first-serve basis to a maximum of 20 Students Members from our section. Student Members may apply for the subsidy by contacting the following section representative:

Treasurer: Joseph Shu 747 3969 x103 jshu@handshakeinteractive.com

Deadline for application is coincident with the conference pre-registration deadline of February 20, 2004. Following the conference and confirmation of participation, IEEE Kitchener-Waterloo Section will upon request to the above contact, reimburse the approved students directly. There is also funding available for travel. The application form can be retrieved from the site: http://ewh.ieee.org/reg/7/ccece04/st_fund.htm

E&CE Design Projects Symposium

U. of Waterloo – Jan 21
The E&CE Design Projects match teams of Waterloo Engineering students with design problems from industry and research. The teams work under the guidance of senior engineers to develop solutions to a wide range of engineering problems. For further information see http://eceprojects.uwaterloo.ca.

Perimeter Institute Lectures

This series has been moved to WCI, see the website for more information.
http://www.perimeterinstitute.ca/activities/public_lectures/
On February 4th, 2004 at 7pm, Robert Brandenberger of Brown University will discuss:
"Was There A Big Bang? - The Current Paradigm of Early Universe Cosmology, its Successes and Problems"

On March 3rd, 2004 at 7pm, Michael Berry will discuss:
"Making Light of Mathematics"

Student Tech Conference

UW daily Bulletin

Students can meet some of the top people in high-tech industry at next week's Canadian Undergraduate Technology Conference -- and there will also be time to play Giant Twister.

Cathy Choi of psychology is one of the UW students involved in organizing CUTC, which will be held at a Toronto hotel January 22-24. She writes: "Want to network with international industry leaders? Want to learn about the latest trends in technology? Want free stuff? Then the Canadian Undergraduate Technology Conference is for you!"
Among the keynote speakers this year are Glenn Edens, vice-president for Research and director of Sun Microsystems Labs; Frank Clegg, president of Microsoft Canada; and Nancy Martin, operations leader for the GE Global Research Centre.
For more information see: http://www.cutc.ca/

Recent Events

Recent IEEE Fellows

The IEEE Grade of Fellow is conferred by the Board of Directors upon a person with an extraordinary record of accomplishments in any of the IEEE fields of interest. The following local members earned this upgrade.

Frank DeWinter

For contributions to the development and application of medium voltage adjustable speed drives.

Andrew K. C. Wong

For contributions to machine intelligence, computer vision, and intelligent robotics.

Senior Member Upgrades

The following local members have earned the professional recognition of their peers for technical and professional excellence.
Richard Dykstra
See http://www.ieee.org/ra/md/smprogram.html for more information on this program.

Centre in arts will create digital archive

Globe and Mail, selected by C. Hulls

"A publicly accessible digital archive" -- described by the Globe and Mail as a "digital junkyard" -- will be one aspect of the Canadian Centre for Arts and Technology, established in UW's Modern Languages building and officially launched December.

"CCAT calls for a cross-disciplinary research approach that will nurture teams of researchers within and across the 16 disciplines in the Faculty of Arts, UW's largest faculty.
"With the approval of CCAT by the UW senate in June, the university has shown its continuing commitment to innovation by upholding the promise of technological research, innovation and application across the campus, as well as embracing new disciplines that will put into context and enrich the pursuit of technological innovation.

http://www.theglobeandmail.com/servlet/story/RTGAM.20031208.wjunk1208/BNStory/Technology/

Dr. Casti On the Limits to Scientific Knowledge

Tom East

The final Perimeter Institute public lecture of the year was held on 3 December at the Waterloo Memorial Recreation Complex. Next year, the series will be moved to Waterloo Collegiate Institute. These events are held on the first Wednesday of each month, and are open to anyone – no need to be a physicist or mathematician. See http://www.perimeterinstitute.ca/

Dr. Casti started by adding a question mark to his title – "The limits to scientific knowledge?" and his entire address had an air of uncertainty. Mathematics is different from science because some theorems, at least, can be proved rigorously.

Various philosophers have made pronouncements such as

"No really interesting question has an answer"
"When you truly understand the question, it disappears."
"There are perfectly reasonable questions (in math) that are undecidable."

Dr. Casti named some big questions of modern science, including The Origin of Life, Language Acquisition, Extraterrestrial Intelligence and Quantum Reality. (He has discussed them in two books – Paradigm Lost and Paradigms Regained).

The standard approach to science is to create a mathematical model which approximates the real world, but the certainty of math is replaced by the uncertainty of the modeling, including the approximations that were neglected. Scientific knowledge is a consensus, and in this respect, differs from both math and the humanities.

Dr. Casti said "Scientific rules are explicit, public, reliable and objective". They can be confirmed by controlled, repeatable experiments. However, this is difficult to do in the case of behavioral science, which can be treated by computer simulation.

A famous subject in physics is the Many-Body Problem. Starting with several bodies (say a solar system) with known positions and velocities, will two of them eventually collide, or will one escape from the system, or will everything go on forever? This can be solved for two bodies, but not more (not even the sun, earth and moon!)

There are, of course, practical limits to scientific knowledge: pick a distance star – does it have planets? There are also political or moral limits – think of genetic engineering. There can be logical limits – the Traveling Salesman Problem, to minimize the distance traveled in visiting N cities – there are (N-1)! possible routes.

Dr. Casti is at the Technical University of Vienna and the Santa Fe Institute. In the spring, he will be setting up an institute in Venice to study the relations between science and art, philosophy and religion.

Growth and Applications of Carbon Nanotubes

Tom East

It was a full house in the University of Waterloo's Davis Centre main lecture hall on October 24th when Prof. Wm. Milne brought us up to date on the work on Carbon Nanotubes at the Engineering Department of Cambridge University, UK. CNTs, as he called them, consist of cylindrical structures of carbon atoms. A single layer CNT consists of a tube made of rings of 10 atoms stacked one on top of another. Multilayer CNTs consist of several tubes inside each other.

CNTs show good electrical and thermal conductivity and great strength, and are chemically inert. Prof. Milne described several ways of making CNTs, including chemical vapor deposition (CVD) with plasma enhancement. Starting from a substrate surface covered with small globules of a catalyst such as nickel, the source gas acetylene (C2H2) builds up a nanotube under each globule, resulting in a hairbrush-like array. In the case of single layer nanotubes, a few of them may be twisted, giving them semiconductor properties: one challenge is to create all of one kind, not a mixture. Multilayer CNTs are always metallic.

The chief application of CNT arrays so far is as Field Emission devices, to replace heated cathodes. A strong field causes electrons to be emitted from the tip of each CNT: a sharp tip is

important. Samsung pioneered this work, to be followed by other companies, and flat panel colour displays have been successfully demonstrated.

Possible future applications include MEMs, solar cells, energy storage devices and a velocity modulated triode: much work remains to be done before they become commercially available.

PI Panel Discussed Canada's International Scientific Reputation

Tom East

On 5th November, the Perimeter Institute of Waterloo held a "public round table discussion" in the Waterloo Memorial Recreation Complex. Moderated by Howard Burton, Executive Director of the Institute, the participants were:

> Tom Brzustowski, President of NSERC (Natural Sciences and Engineering ResearchCouncil of Canada)
> David Johnston. President of University of Waterloo
> Mike Lazaridis, President and co-CEO of Research In Motion
> Stephen Strauss, Science Reporter for the Globe and Mail
> Thomas Thiemann, Researcher, Perimeter Institute

The event consisted mostly of statements by the participants, with only a short time for audience questions. Besides "What is Canada's international reputation", questions asked were "What should it be", and "How could that be achieved". There was a lot of discussion about recruiting and funding. In fact, the 90 minutes were well worth attending.

Among the facts that emerged were these:
Canadian research is under funded in comparison to other developed countries, but the results are greater in proportion. To improve this situation, governments must increase funding, and universities must lighten teaching loads.
Foreign graduate students should be encouraged to come: the statement in many job postings that "preference will be given to Canadians" should be eliminated.
Citations of Canadian articles in journals is increasing.
The Canadian system of funding 21 "Networks of Excellence" in which geographically separated groups cooperate in research projects works well: there is nothing like it in the USA, where groups compete: If the US had our system, an AIDS vaccine might have been found by now.
In Germany, there are 80 Max Planck Institutes, equivalent to our Perimeter Institute.
Of the 11 Canadian Nobel Prize winners so far, 7 had moved to the US when they received their award. Of the other 4, only one was Canadian born.
Location is important to productive research: Canada is calm and peaceful compared to the USA. According to Michener's book "Iberia" in 1490, the University of Salamanca was a leading institution, but the Spanish Inquisition expelled Jews and Muslims and steep decline set in.
In Canada, there are NO scientists in cabinet. In government priorities, universities come below schools, health and so on. The public should let their MPs know that they think research is important, so the subject comes up in caucus.
As a final hopeful note, in 1994, the Minister of Finance at the time stated that research is very important and should be funded. That Minister was Paul Martin.

UW Innovate Funded

KW Record
A grant will allow this non-profit organization to put co-op students to work discovering how small and medium sized businesses can make use of local university skills and information.

Mayors Share Long Distance Handshake

KW Record

Local company, Handshake Interactive Technologies, arranged a handshake between KW mayors and the mayor from the Florida city of Altamonte Springs while attending a trade show. The technology allows the sense of touch to be built into commercial applications.

Smart Cars move Forward

KW Record

Intelligent Mechatronic Systems, a Waterloo company, has developed a line of smart sensors and recorders for the auto industry. These include air bag control systems and a “black box” for vehicles.

Professor Cassuto Described Scientific Fraud

T. East

The Perimeter Institute series of public lectures started the New Year in a new location. Instead of the Waterloo Memorial Recreation Complex, the locale for the lecture of 7 January was the auditorium of the Waterloo Collegiate Institute. This room, with raked floor and sound control booth holds about 500 people: it was nearly filled to capacity that cold night.

The speaker, Prof. Leonardo Cassuto, described perhaps the greatest fraud in scientific publishing in recent times. It described work that was supposed to have taken place in Lucent Laboratories (formerly Bell Labs). Dr. Hendrick Schon published about 90 papers in 3 or 4 years, an almost unheard of rate of production. All papers had been submitted to reputable journals, including the prestigious "Nature" and "Science" and had been peer reviewed and published. They described experiments which claimed to show organic crystals which had been made to behave as semiconductors, including pentacene as photovoltaic, and C60 (buckyballs) superconducting at low temperatures. Dr. Schon seemed to be heading for a Nobel Prize. After publication, other scientists attempted to repeat the results without success: this was the first warning of something amiss. Someone pointed out that the same graph appeared in two separate papers, with different axes, purporting to be the result of separate experiments: this was the second warning. Eventually all Dr. Schon's work was discredited.

How did such nonsense get through the system? Nature and Science are in fierce competition to be first to publish breakthroughs. When a paper is submitted to a journal, the editor sends it out to (usually) two referees, who are experts in the particular subject. These are unpaid, and consider it an honour to be asked to take on this task. They do not attempt to repeat the experiments, but consider whether the method described is valid and the conclusions are logical. Their comments are passed to the editor, who decides whether to reject or accept as is, or he/she can send the comments back to the authors and request changes before publication: the referees remain anonymous.

The papers in question had three authors: Schon, Schon's boss and the chemist who prepared the crystals. The judgment of an enquiry was that both Schon and his boss were guilty of unethical conduct, but the chemist was innocent.

In the question and answer period after Prof. Cassuto's talk (efficiently arranged with roving microphones) prepublication by the authors on the Web, inviting comments by other scientists was suggested: the infamous press conference on Cold Fusion by Pons and Fleisher is not the way to do it.

The Perimeter Institute public lectures are held at 7 pm on the first Wednesday of each month in the Waterloo Collegiate Institute, 300 Hazel Street (due north of WLU). Best to get a ticket beforehand: contact PI at tickets@perimeterinstitute.ca or phone 519-569-7600 ext 247, and pick it up at PI's temporary headquarters, 35 King Street North, or at the WCI by 6.45 pm the night of the lecture.

Nanotechnology: Quantum Engineering for the Optical Internet

IEEE Section presentation Dec 8 Presented by:
Prof. Edward (Ted) H. Sargent
Nortel Networks - Canada Research Chair in Emerging Technologies
University of Toronto

Nanotechnology harnesses physical phenomena, which arise on the nanometer length scale. It seeks to meet the functional requirements of information technology and communications by exploiting the regime of quantum confinement of electrons. Bottom-up nanotechnology implements these functions through advances in materials chemistry, including natural and stimulated self-organization. Results were presented which demonstrate the use of quantum dots embedded in processible semi conducting polymers to produce light across the entire optical communications spectrum. Discussion on how combining these materials with three dimensionally photon-length scale textured materials can control electrons and photons in tandem and may facilitate the realization of an agile optical network.

LaFlamme Introduced the Institute for Quantum Computing

Tom East

On 27 November 2003, the Microwave Theory and Techniques Chapter of the KW Section held a seminar on Quantum Computing. The speaker was Raymond Laflamme, founder of the Institute for Quantum Computing in the University of Waterloo, and member of the Perimeter Institute. He earned his Ph.D under Stephen Hawking.

Laflamme started by extrapolating Moore's Law, according to which the number of transistors on a chip doubles every 18 months. By 2020, if the law is followed, each transistor would be the size of one atom! Long before that, designs will have to take account of quantum effects in atoms and molecules.

The Institute has about 14 faculty members, 5 other staff, 18 graduate students and 5 post-doctoral fellows, and is still recruiting (see http://www.iqc.ca). It has an impressive list of sponsors, including NSERC and other federal funds, the Ontario government, the Perimeter Institute and Mike Lazaridis himself, and the Centre for applied cryptographic Research at the University of Waterloo. What is the connection with cryptography? If you can factor a large number into two primes, you can break a code. The CIA and other institutions such as banks are interested to know how large such a number must be to make it unbreakable in practice, and quantum computing aims to vastly increase the speed of such calculations.

At the Institute, they are doing experiments with trichlorethylene (a favorite fluid at dry cleaners) in a magnetic field. Nuclear spin can be "up" or "down" to represent a 0 or a 1. They have built gates with 6 "qbits" and are working on 10 qbits. Their field of study includes quantum cryptography, quantum communications, quantum algorithms, experimental quantum computing, physical implementation and quantum error correction.

Raymond Laflamme concluded by observing that every time humanity has learned to tame a new phenomenon, a revolution follows (Newtonian mechanics, electromagnetism). He feels that engineers should learn to understand and apply quantum mechanics as they did Newtonian mechanics.

(This observer will be interested to see if developments of quantum computers follow that of some early experiments in "conventional" computers – playing tic-tac-toe, and printing lists of prime numbers!).
<editor's note: The KW Record included an article on Raymond Laflamme on January 3, 2004.>

UW researcher heads fuel cell study

UW Daily Bulletin, selected by C. Hulls

Attempts to create a viable and economical fuel cell vehicle are well underway, but mass production of these vehicles is still at least several years away. Advancing this research is the goal of a national research team being led by Waterloo researcher Xianguo Li, mechanical engineering. He is coordinating a team that consists of researchers at Simon Fraser University, the University of Ontario Institute of Technology, University of Toronto and the University of Windsor.
http://www.me.uwaterloo.ca/dept/li.html
http://www.auto21.ca/

U of G to unveil weather-operated sculpture

Guelph website
An outdoor sculpture that continually changes based on how the wind is blowing will be unveiled at the University of Guelph Jan. 15. Mounted on the northern wall of the Macdonald Stewart Art Centre, the sculpture is operated by an anemometer on the roof of the building that reads wind speed and direction. "As far as I know, it's the only outdoor sculpture in Canada that's operated by nature," said Judith Nasby, art centre director.

Eight rings forming an oval shape with a bar of lights down the centre will be visible to people driving or walking south along Gordon Street. The exterior of the eight rings will remain lit in primary colours, but a line through the centre of each ring will be illuminated only by wind direction. The bar of lights down the centre of the formation is an indicator of wind speed. "The sculpture is like a brilliant illuminated jewel that will be visible even during the daytime."

UW's R&T park to Support New Ventures

UW Daily Bulletin, Selected by C. Hulls
Proposals are being requested for the park's second building, a multi-tenant structure that includes an "accelerator centre" for tiny businesses on their way to bigger success.
"We have an explicit commitment from a select complement of our faculty," one briefing says, "to welcome the opportunity to collaborate with the Research Park's tenants. . . . A leadership team of alumni is explicitly committed to offering its expertise. . . . Tenants will be given Access Program coordination resources to assist them with multiple types of activities focused at the student body to raise their own profile among this key audience."

UW man takes wireless to Mali

Daily Bulletin
A UW staff member leaves this weekend for four months in the flat, dry west African country of Mali, helping set up wireless networks for community radio stations and information centres. "I am selfishly hoping to garner support" for the project, writes Ian Howard of the information systems and technology department. He's particularly looking for equipment.
"When I applied to GeekCorps two years ago, I had just become involved with wireless technologies and began to think of the implications of this technology could have.
"The GeekCorps project in Mali will be to interconnect these stations and to provide Internet connectivity to allow these stations to research material from the Internet and to share programming with other French speaking or local language partners. During my four-month visit, I will be stationed in Bamako, Mali's capital. John Buckham, the GeekCorps Mali project coordinator, and I will make contact with the community radio stations, establish partnerships with local businesses and organizations and begin to determine how volunteers to succeed my visit will implement this network.
"I believe that this project will be a great opportunity for me to contribute to a great idea.
"Despite its status as one of the world's poorest nations, Mali's stable government and mineral wealth offer great potential for the future. It is due to that potential that Mali has received great attention by development organizations over the past few years. Organizations like geekcorps hope to provide the infrastructure that will allow this nation to escape poverty and realize the potential of its warm people." Anyone here who can provide equipment, or other kinds of support, is invited to get in touch with Howard in IST, or with Gina Dario, program director of GeekCorps, gina@geekcorps.org.

http://dingo.uwaterloo.ca/~ihoward/geekcorps/
http://www.geekcorps.org/

System Support for Application Adaptation

IEEE presentation on November 6 by:
Eyal de Lara Assistant Professor Dept. of C.S & Dept. of E&CE University of Toronto

Applications need to adapt to the limited and variable resources, such as bandwidth and power that characterize mobile environments. This talk introduced Component-Based Adaptation, a novel approach that supports powerful adaptation policies without requiring modifications to the application's source code. In Component-Based Adaptation, the applications expose a runtime Application Programming Interface (API) to enable adaptation. The system adapts applications by calling their API methods. Because source code modification is not necessary, even proprietary applications, such as productivity tools from Microsoft's Office suite, can be adapted, and applications can be adapted long after they have been deployed. Even if source code is available, development time for implementing adaptation is much reduced.
Also described in the talk was Adaptation-Aware Editing and Progressive Update Propagation, two novel mechanisms that enable authoring multimedia content and collaborative work on mobile devices. Adaptation-Aware Editing enables editing content that was adapted to reduce download time to the mobile device. Progressive Update Propagation reduces the time for propagating content generated at the mobile device by transmitting either a fraction of the modifications or transcoded versions thereof. With Application-Aware Editing and Progressive Update Propagation, an object present at a mobile device is characterized not only by a particular version, as in conventional replication, but also by a particular fidelity.

Applications of Photonics to Communications, Interconnects & Sensors

Tom East

On Wednesday morning 5th November, the Microwave Theory and Techniques Chapter of the KW Section presented Dr. Ishak, Director of the Communications and Optics Research Lab at Agilent Laboratories, giving an overview of their work on “Applications of Photonics in Communications, Measurements and Sensors.”

Agilent, which employs about 315 people, split off from Hewlett-Packard of Palo Alto in 1999. It concentrates on Applied Research (with a 5-7 year horizon), taking a position between Basic Research (10-15 year) and Product Development (1-2 year).

Among the devices they have come up with are a Ferroelectric Memory, which could replace flash memory, GaAs pHEMT amplifiers with increased efficiency (important to lengthen battery life in handheld devices), MEMS devices such as a small acoustic resonator and a 20 Giga sample/sec analog to digital converter in CMOS (for high end oscilloscopes)

In Life Sciences, they are investigating “nanopores”. A DNA or RNA molecule could pass through one of these holes: each base (A,C,G or T) would produce a different impulse in an electric probe, so that the molecule could be sequenced.

Challenges to be considered are: reducing the power density in semiconductor devices (which has remained constant for many years) and the Terahertz Gap (10^11 – 10^13 Hz) between microwaves and infrared.

Dr. Ishak concluded with his “wish list” – what he would like to see come out of universities:
A laser array with 10 by 100 lasers, threshold current <0.2 mA, threshold voltage <1.4 V.

Tuneable laser at room temperature covering 2-20 µm or 50-100 µm.
Optical equivalent of wire-bonding or electrical soldering.
Solid state optical memory.

WiFi Industry and Technology Analysis

IEEE seminar Nov 27 by
Alberto Leon-Garcia and Tony Yuen, University of Toronto
WiFi technology and "hotspots" have generated much attention in both the IT and telecom industries. The IEEE 802.11 wireless LAN has already found a place in homes. The enterprise and Public Wireless LAN service (PWLAN) are viewed as subsequent targets. This talk presented the results of a Wi-Fi Industry Analysis. Included was a model for analyzing the Wi-Fi value chain and we examined the technical and business aspects of Components, Equipment, and Service Providers. We also provided observations on the strategies pursued by component manufacturers and identify possible scenarios in the evolution of the enterprise and PWLAN markets. Also discussed were keys networking issues associated with WiFi deployment.

Alternative Energy

Electric Cars Arrive

Tom East from The KW Record

The 2004 Toyota Prius hybrid-electric car is claimed to be the first hybrid in mass production. Motor Trend magazine proclaimed it the “2004 Car of the Year”. Natural Resources Canada says that it is the most fuel-efficient car in the mid-size range. The car achieves 4 litres per 100 km (70 mpg) in city driving.

Hybrid cars use a relatively small gasoline engine: when the demand for power is low, it charges a heavy duty battery, which boosts the drive when demand is high. For more information on fuel consumption see http://oee.nrcan.gc.ca/vehicles .

Solar panels onto UW Fed Hall

UW Daily Bulletin, selected by C.Hulls
A 36-panel photovoltaic solar array was installed on the top of Federation Hall during November and was connected to the grid in January. This is the first student-designed solar array on a university campus in Canada. The array was the target for the Solar Technology Education Project.
STEP is a multi-disciplinary group of students and faculty who started in January 2002 with the aim of bringing the first student-designed solar array to the UW campus as a demonstration of renewable energies and climate change solutions.

The free electricity produced by the solar array will save UW $200 annually, DeLoyde says. A display board with a real-time readout of the array's electricity production will be built in front of Fed Hall. He notes: "The solar array employs leading-edge technology and was designed so that the electricity produced will be fed back into UW's power-supply grid in a process called grid-tying. This will avoid the use of environmentally hazardous batteries. Using the grid-tied technology, if all the electricity is not used in Fed Hall, it can be fed into UW's grid and be used anywhere on campus."
http://www.STEP.uwaterloo.ca/

Waterloo Couch Bike tours Maritimes

Bicycling Selected by M. Hulls
Brent Curry, a Waterloo mechanical engineer built a bike-powered couch and then toured 330 miles across New Brunswick and PEI. Brent says then hit a top speed of 44 kph but a palpable fear of death persuaded us to slow down.

PeaceWorks helps those in need

KW Record

A group of local men and women work with PeaceWorks to provide an Information-Technology department for clients that can't afford one of their own. They maintain computers, build websites and design software for non-profit agencies and small businesses. For more information see: http://www.peaceworks.ca .

Letter to the Editor

The Editor
KW Newsletter

In the September 2003 edition, page 8, Fay Dowker is quoted as saying "Under Causal Set Theory, space-time is not continuous, but is "pixilated". The word was used in a classic movie (I think Mr Smith goes to Washington) by two old ladies to describe the defendant. According to Webster's Dictionary, pixilated means "slightly unbalanced mentally; eccentric". However, Dowker spelled it "pixellated" on her overhead, meaning consisting of "pixels" (picture elements) as in a digital TV picture. I suspect that Prof. Dowker used the similar sounding word deliberately. Spell checkers sometimes spoil the fun.

Tom East

Engineering Humor

Number Puzzle

Tom East
What is the next number in this series (indicated by XX)?

71, 42, 12, 83, 54, XX

Answer in our next issue.

Clever Dog

Tom East

This is a true story, heard on CBC Radio recently.
A blind woman had a guide dog, and to keep him happy, she gave him several toys to play with while he was not working (guiding her). One of them was a 12 inch wooden ruler, and he liked it so much, that he often carried it in his mouth, even when he was working. One day, they were walking along a corridor in a public building, when they came to a fire door, only one half of which was open. The dog managed to lead her through it. Two men were standing nearby: one said to the other "Did you see how that dog measured the doorway to make sure they had room to get through?"

NYSE Still Human

The Economist, submitted by Tom East

Fidelity Investments, America's biggest mutual-fund company, called for the New York Stock Exchange to go electronic. The exchange is the only major stock market with a residue of waving humans on the floor.